

Monetary Policy, Fragility, and Fund Flows

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SAFE

Frankfurt, 17 November 2025

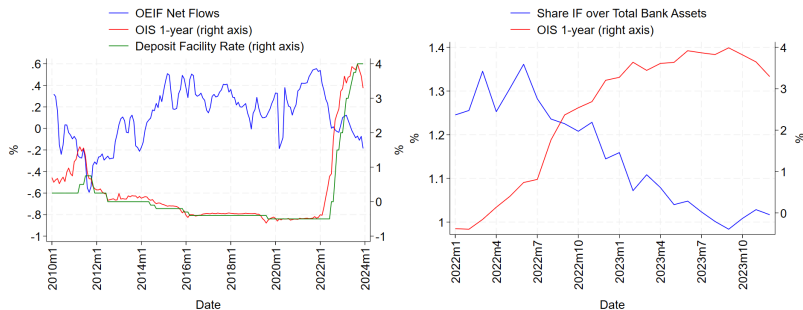
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- ➋ Data and Proneness Measure
- ➌ Net Flows of Funds and Monetary Policy
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- ➎ Further Analysis and Robustness
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FLows AND LIQUIDITy BUFFERS OF OPEN-END INVESTMENT FUNDS (OEIFs) MOVE AGAINST MONETARY POLICY

Fund net flows (left panel) and fund cash buffers held at banks (right panel) vs. EA interest rates



Sources: Morningstar, LSEG, ECB and own calculations. Notes: The left panel shows monthly German OEIF net flows against euro area interest rates. The right panel plots the share of German banks' overnight deposits from euro area investment funds compared to total bank assets against the euro area 1-year OIS rate. Investment funds exclude money market funds. Latest observation: Dec2023.

- Negative relationship particularly pronounced in tightening cycles
- This paper: outflows from OEIFs and OEIFs' readjustment of cash buffers are aggravated by funds that are susceptible to panic-induced withdrawals

FUND RUN RISK AND COMPARISON TO BANKS

- ▶ Potential for self-fulfilling panic-induced runs in OEIFs ([Chen et al. \(2010\)](#)) similar to banks with uninsured deposits ([Diamond and Dybvig \(1983\)](#); [Goldstein and Pauzner \(2005\)](#))
- ▶ Monetary policy tightening can be amplified by outflows of uninsured deposits and even runs on banks ([Drechsler et al. \(2023\)](#))
- ▶ We study transmission and amplification effects of monetary policy through OEIFs that are susceptible to panic-induced withdrawals

SUMMARY

- ▶ First, show that monetary policy tightening surprises generally trigger net outflows of OEIFs over time
 - ▶ RQ1: Does the reaction to these surprises depend on how fragile a fund is, i.e. on the potential of the fund to face panic-induced withdrawals?
 - ⇒ Yes, fragility is a key characteristic for monetary policy transmission
 - ▶ RQ2: Do fragile funds withdraw bank deposits and adapt liquidity buffers when meeting elevated investor outflows following unexpected tightening?
 - ⇒ Yes, fragile funds not only have to provide more liquidity to meet elevated withdrawals but they also reduce their relative cash buffers → spillovers to banking sector
- ⇒ In mutual fund sector, monetary policy tightening is mainly transmitted and amplified by funds that are susceptible to panic-induced withdrawals

LITERATURE

- ▶ OEIF fragility (e.g. [Chen et al. \(2010\)](#); [Goldstein et al. \(2017\)](#))
- ▶ Non-linear flow-performance relationships at fragile OEIFs ([Goldstein et al. \(2017\)](#); [Cetorelli et al. \(2022\)](#); [Dekker et al. \(2024\)](#); [Falato et al. \(2021\)](#))
- ▶ Recent but scant literature on monetary policy and NBFIs ([Banegas et al. \(2022\)](#); [Giuzio et al. \(2021\)](#); [Cetorelli et al. \(2022\)](#)):
 - Our work is closest to [Kuong et al. \(2024\)](#):
 - ▶ Explicitly link monetary policy with the fragility aspect of OEIFs and use high frequency data
 - ▶ Outflows around *expected* interest rate increases due to stale fund prices
 - ▶ They focus on one specific aspect of fragility in the corporate bond sector
 - ▶ We, instead, provide a broader interpretation of fragility
 - Cross-sectional heterogeneity in performance sensitivity as sufficient statistic for general run-proneness across several fund types
 - Relevant in times of *unanticipated* shocks
 - Our results complement [Fang \(2024\)](#), who provides evidence of a bond fund flow amplification of monetary policy to bond holdings, prices and issuance

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DATA

- ▶ Daily share-class level data, spanning 2010-2023, all DE-domiciled open-ended retail investment funds (Morningstar), various categories
- ▶ Merged with monthly data from Bundesbank's Investment Funds Statistics database
- ▶ Monetary policy surprises from [Jarociński and Karadi \(2020\)](#)
- ▶ Data for fund-bank analysis (SHS, BISTA)

FUND-SPECIFIC FRAGILITY (PRONENESS TO PANIC-INDUCED WITHDRAWALS)

- ▶ Many (partly unobserved) characteristics for fragility
- ▶ 'Overreaction' of fund investors to underperformance ([Chen et al. \(2010\)](#)) is the symptom typically brought about by the specific fund characteristics suggested in previous studies (e.g. [Goldstein et al. \(2017\)](#); [Falato et al. \(2021\)](#); [Dekker et al. \(2024\)](#))
- ▶ Comprehensive proxy for individual fragility of a mutual fund of any style
- ▶ In the spirit of the literature using non-linear flow-performance regressions to investigate fragility in OEIFs (e.g. [Goldstein et al. \(2017\)](#)), for each share-class, estimate weekly time-series model:

$$Flow_{i,t} = \alpha_i + \gamma_{1,i}ExR_{-,i,t-1} + \gamma_{2,i}ExR_{+,i,t-1} + \theta\mathbf{X}_{i,t} + \epsilon_{i,t}. \quad (1)$$

- $Prone_i = 1$ if $\hat{\gamma}_{1,i} > 0$, $\hat{\gamma}_{1,i} > \hat{\gamma}_{2,i}$ and $\hat{\gamma}_{1,i} > med(\hat{\gamma}_1)$
 - Positive, concave and strong relationship
- ▶ In line with literature (e.g. [Goldstein et al. \(2017\)](#)), proneness measure is related to larger share of fixed-income and especially corporate bond assets, longer asset maturity, larger share of high-yield assets, etc.

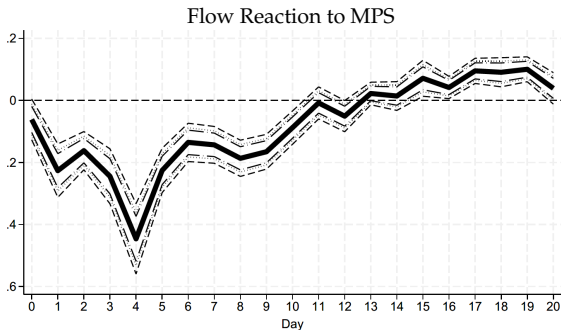
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NEGATIVE FLOW REACTION TO MPS

- First, establish general response of OEIF net flows to monetary policy surprises (MPS) over time using local projection ([Jordà \(2005\)](#)):

$$Flow_{i,t+h} = \beta_h MPS_t + \theta_h X_{i,t} + \alpha_i^h + \epsilon_{i,t+h}, \quad (2)$$

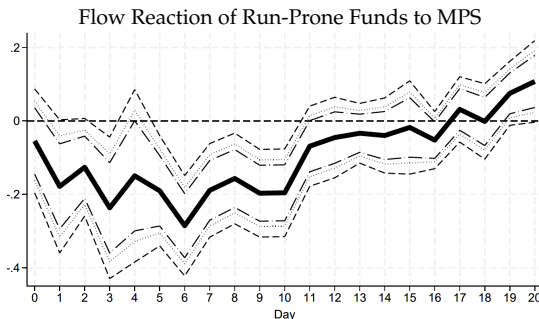


Notes: Local projection coefficient estimates (solid line) based on estimating the specification in Equation 2. Long dashed, dotted and short dashed lines denote 90%, 95% and 99% confidence intervals, respectively.

- 10 bp MPS decreases flows by more than 0.2 pp over 10 days (0.7 SDs)

NEGATIVE FLOW REACTION OF RUN-PRONE FUNDS TO MPS

$$Flow_{i,t+h} = \beta_h MPS_t \times Prone_i + \theta_h \mathbf{X}_{i,t} + \alpha_i^h + \mu_{t,c}^h + \epsilon_{i,t+h}, \quad (3)$$



Notes: Local projection coefficient estimates (solid line) based on estimating the specification in Equation 3. Long dashed, dotted and short dashed lines denote 90%, 95% and 99% confidence intervals, respectively.

- Control for heterogeneous effects of monetary policy on funds' asset values
- Reaction to MPS depends on potential to face panic-induced withdrawals
→ roughly 3x more negative effect for run-prone funds

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FRAGILE FUNDS REDUCE THEIR BANK DEPOSITS AND RELATIVE CASH BUFFERS

$$Y_{i,t} = \beta MPS_t \times Prone_i + \theta X_{i,t} + Fixed\ Effects + \epsilon_{i,t}. \quad (4)$$

Bank Deposits and Relative Cash Holdings of Run-Prone Funds

Dependent Variable	(1) Bank Deposit Flow	(2) Bank Deposit Flow	(3) Δ Cash Portfolio Weight	(4) Δ Cash Portfolio Weight
MPS	1.317*** (0.429)		2.720* (1.553)	
MPS × Prone	-1.521** (0.601)	-1.544*** (0.595)	-4.670** (2.230)	-4.539** (2.077)
Observations	164,014	163,992	27,949	27,949
Adj. R-squared	0.074	0.094	0.125	0.176
Controls	Yes	Yes	Yes	Yes
ISIN Fixed Effects	Yes	Yes	Yes	Yes
Month × Type FE		Yes		Yes
Sample	Full	Full	Bond	Bond

Notes: Estimates based on Equation 4. Bank Deposit Flow is scaled by lagged TNA. Cash is defined as cash and equivalents holdings with a maturity of up to three months and measured as a share of the fixed-inc. portfolio. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

- ▶ More resilient funds, which cater much less redemptions, even increase deposits and relative cash buffers by 0.1 and 0.3 pp following 10 bp MPS - e.g. capitalize on higher rates
- ▶ Fragile funds not only withdraw bank deposits when facing elevated investor redemptions but also structurally reduce relative cash buffers by 0.2 pp overall → spillovers to banks

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FURTHER ANALYSIS

- ▶ Next question: what do investors do with the proceeds from redeeming their fund shares?
- ⇒ Attenuating impact of household deposit flows for banks that initially hold a high share of prone funds for customers: increase in households' overnight money accounts at those banks following surprise tightening
- ▶ Fang (2024) finds bond funds decrease corporate bond holdings after tightening, comes with lower bond prices and firms' bond issuance
- ▶ Using monthly regression, we find prone bond funds further reduce their portfolio share in corporate bonds compared to non-prone funds
- ⇒ Fund fragility also amplifies monetary policy transmission to bond markets
- ▶ Results for fund cash analysis are confirmed in matching approach

SELECTED SUPPORTING EVIDENCE AND ROBUSTNESS - FLOW ANALYSIS

- ▶ Ensure that results for prone funds are driven by depressed net flows following surprise monetary tightening instead of net inflows following easing
- ▶ Negative central bank information shocks trigger negative flow reaction
- ▶ Larger effects for subsamples of fund types typically emphasized in fund fragility literature (fixed-income, etc.)

- ▶ Robust to further sample splits and controlling for overall market volatility
- ▶ Robust to more stringent prone identification
 - Higher cutoff ($\hat{\gamma}_{1,i} > p90(\hat{\gamma}_1)$) yields twice as large response → effect increasing in fragility-potential
 - Rolling-window regressions to allow for time-varying, predetermined fragility → no reverse causality from time-invariant definition of fragility
 - Demeaning coefficient estimates from prone regressions with fund style-average
 - ▶ to already at this stage take into account investment style-specific characteristics
 - ▶ works against potential concern that results may be driven by prone itself being affected by MPS
 - Dropping observations within two weeks following ECB event from prone regressions → also addresses this potential endogeneity concern

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SUMMARY OF RESULTS, IMPLICATIONS AND OUTLOOK

- ▶ Unexpected monetary policy tightening triggers outflows of OEIFs
 - ▶ Main analysis:
 - Comprehensive proxy for fragility-potential of a fund based on 'overreaction'-tendency of fund investors is relevant for transmission of monetary policy
 - Tightening surprises trigger net outflows from especially prone funds that are 3x larger and of economically meaningful size
 - ▶ Further effects: Deposit flows and portfolio readjustments suggest spillovers to other markets, in particular the banking sector
- ⇒ In OEIF sector, monetary policy tightening is mainly transmitted and amplified by funds that are susceptible to panic-induced withdrawals
- ▶ Policy implications:
 - Strength of monetary policy transmission might change with increased importance of OEIFs, also depending on liquidity risk assumed by them and their susceptibility to panics
 - Potential regulatory changes affecting OEIFs fragility, e.g. via mandatory liquidity management tools, might mute transmission of monetary policy outlined in this work

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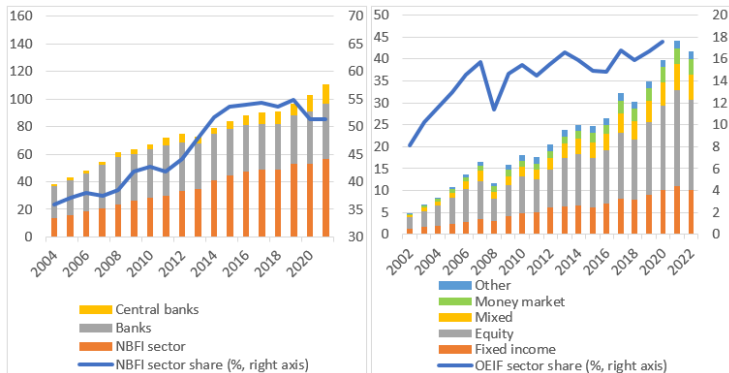
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LARGE, GROWING IMPORTANCE OF NBFIs AND OEIFs

Total financial assets of the euro area (left panel) and OEIFs (right panel)

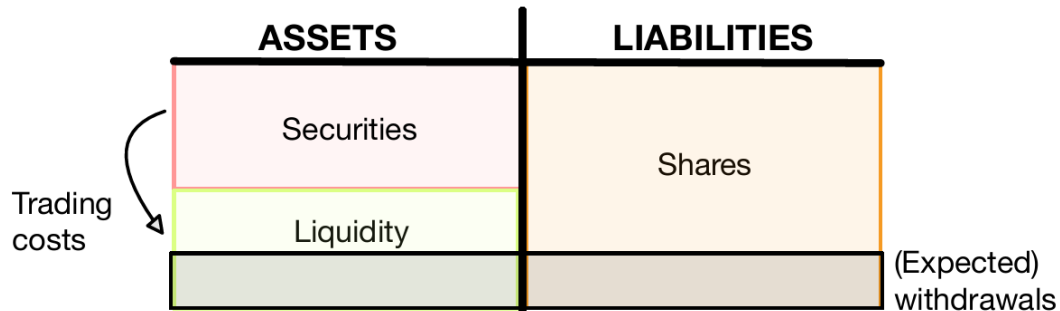
(Left axes: USD tn. right axes: %)



Sources: FSB, IMF, Morningstar and own calculations. Notes: NBFI includes insurance companies, pension funds, other financial institutions such as OEIFs and financial auxiliaries if available. Banks includes all deposit-taking corporations. Latest observation: 2022.

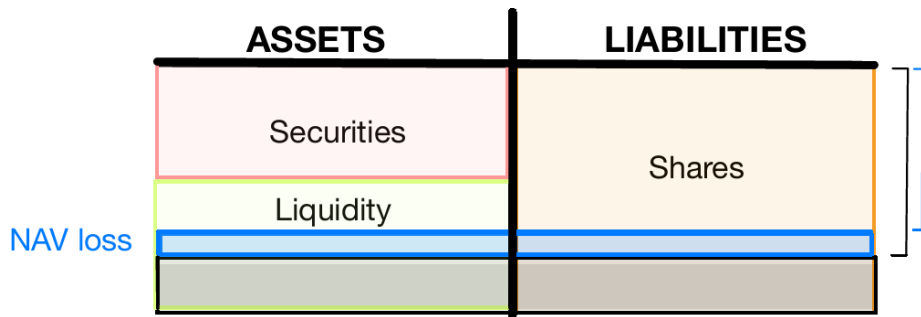
- NBFIs now account for roughly 50% of euro area total financial assets
- OEIFs' assets increased from roughly 5 to 17 USD tn in 20 years

FUND RUN RISK MECHANISM AND COMPARISON TO BANKS



- ▶ Potential for self-fulfilling panic-induced runs in OEIFs ([Chen et al. \(2010\)](#)) similar to banks with uninsured deposits ([Diamond and Dybvig \(1983\)](#); [Goldstein and Pauzner \(2005\)](#))
- ▶ Monetary policy tightening can be amplified by outflows of uninsured deposits and even runs ([Drechsler et al. \(2023\)](#))
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OBSERVATIONS BY FUND TYPE

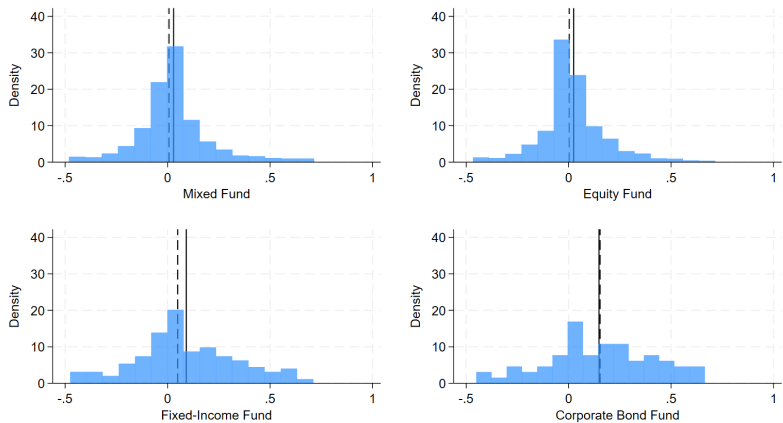
Share-Class Level Observations by Type of Retail Fund based on Morningstar Global Broad Category Group

Fund Type	Frequency	Percent
Allocation	2,573,996	48.27
Alternative	97,039	1.82
Convertibles	28,570	0.54
Equity	1,602,637	30.05
Fixed-Income	976,759	18.32
Money Market	53,814	1.01
Total	5,332,815	100.00

Notes: Allocation funds are mixed funds.

COEFFICIENT DENSITY

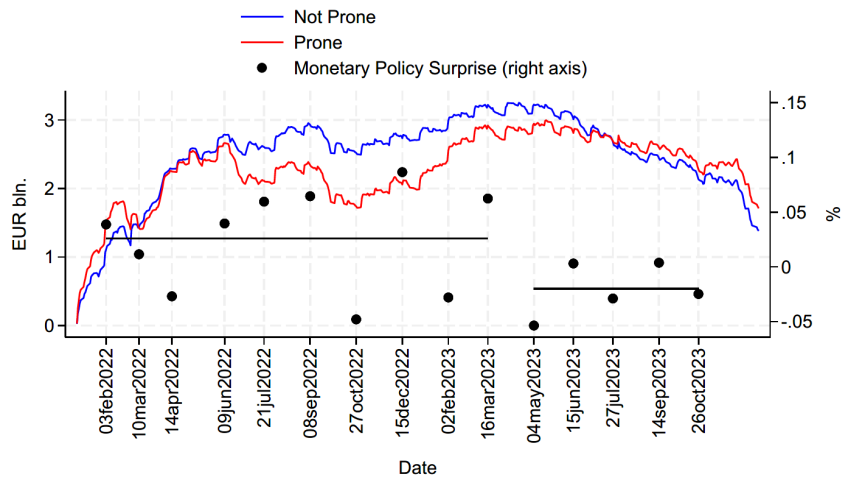
Density of Coefficient Estimates of the Negative Excess Return Variable for Selected Fund Types



Notes: Coefficient estimates for each share class are based on Equation 1. Type is based on Morningstar Global Broad Category except for corporate bond funds, which are part of the fixed-income fund sample and identified using the narrower Morningstar Category. Means and medians are denoted by the solid and dashed lines, respectively. Coefficient estimates are trimmed at the 5th and 95th percentile to enhance readability.

CUMULATIVE NET FLOWS DURING RECENT TIGHTENING

Cumulative Net Flows by Proneness and Monetary Policy Surprises



Notes: Daily flow data spans the period 1-Jan-2022 to 31-Dec-2023. Black lines denote the average of monetary policy shocks for the two subsamples.

SUMMARY STATISTICS BY PRONENESS

Summary Statistics by Proneness

VARIABLES	Not prone					Prone				
	N	mean	sd	min	max	N	mean	sd	min	max
γ_1	2,905,232	-0.18	1.39	-58.76	38.24	2,427,583	0.37	3.22	0.01	126.76
γ_2	2,905,232	0.06	1.97	-224.37	200.61	2,427,583	-0.22	1.18	-48.17	2.51
Log(Age in Days)	2,905,232	7.98	0.91	5.90	10.20	2,427,583	7.96	0.87	5.90	10.12
Return (%)	2,889,487	0.02	0.69	-16.82	10.92	2,415,038	0.02	0.64	-16.82	10.92
Flow (%)	2,763,158	-0.00	0.28	-19.77	39.48	2,307,431	0.00	0.31	-24.02	39.48
Log(TNA)	2,819,321	17.66	1.37	15.44	22.56	2,351,103	17.76	1.44	15.44	22.56
Excess Return (%)	570,961	-0.04	0.95	-12.05	11.29	477,214	-0.03	0.89	-12.05	11.29
Corp Bond Holdings (%)	2,015,417	21.80	26.42	0.00	98.08	1,665,832	26.47	27.98	0.00	98.08
Excess Return Neg (%)	570,961	-0.33	0.62	-12.05	0.00	477,214	-0.30	0.58	-12.05	0.00
Excess Return Pos (%)	570,961	0.29	0.57	0.00	11.29	477,214	0.27	0.54	0.00	11.29
Corp Bond Fund	2,905,232	0.02	0.15	0.00	1.00	2,427,583	0.03	0.18	0.00	1.00
Mixed Fund	2,905,232	0.48	0.50	0.00	1.00	2,427,583	0.48	0.50	0.00	1.00
Equity Fund	2,905,232	0.33	0.47	0.00	1.00	2,427,583	0.27	0.44	0.00	1.00
Fixed Income Fund	2,905,232	0.15	0.35	0.00	1.00	2,427,583	0.23	0.42	0.00	1.00
Money Market Fund	2,905,232	0.01	0.12	0.00	1.00	2,427,583	0.01	0.08	0.00	1.00
Other Fund	2,905,232	0.03	0.17	0.00	1.00	2,427,583	0.02	0.13	0.00	1.00

FLOW REACTION OF RUN-PRONE AND OTHER FUNDS TO MPS AT SELECTED HORIZONS

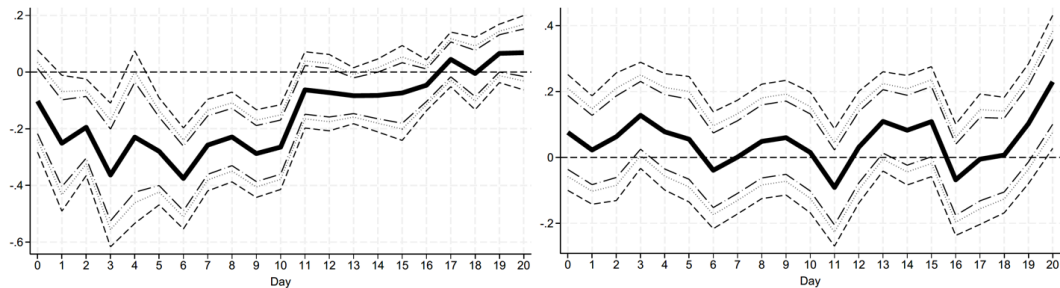
Flow Reaction of Run-Prone and Other Funds to MPS

Horizon in Business Days	Coefficient		Cumulative Sum of Coefficient		Observations
	MPS	MPS $\times$ Prone	MPS	MPS $\times$ Prone	
0	-0.02 (0.03)	-0.07 (0.06)	-0.02	-0.07	4,607,039
1	-0.13*** (0.04)	-0.19** (0.07)	-0.15	-0.26	4,547,551
2	-0.11*** (0.03)	-0.15*** (0.05)	-0.26	-0.41	4,559,960
9	-0.07** (0.03)	-0.19*** (0.05)	-1.11	-1.89	4,533,457
10	-0.01 (0.03)	-0.18*** (0.05)	-1.12	-2.08	4,536,810
20	-0.01 (0.03)	0.11** (0.04)	-0.69	-2.11	4,471,929

Notes: Local projection coefficient estimates and their cumulative sums based on estimating the specification in Equation 3 but omitting fund type times date fixed effects $\mu_{t,c}^h$. Robust standard errors clustered at the share-class, i.e. ISIN, level are in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

NEGATIVE NET FLOWS OF RUN-PRONE FUNDS DUE TO TIGHTENING

Flow Reaction of Run-Prone Funds to Surprise Monetary Tightening (Left Panel) and Easing (Right Panel)



Notes: Local projection coefficient estimates (solid line) based on estimating the specification in Equation 3 using two monetary policy surprise measures jointly, $(\max(MPS_t, 0))$ and $(\min(MPS_t, 0))$. Long dashed, dotted and short dashed lines denote 90%, 95% and 99% confidence intervals, respectively.

- Results for prone funds are driven by depressed net flows following a surprise monetary tightening instead of net inflows following an easing

FRAGILE BOND FUNDS ADAPT PORTFOLIO WEIGHTS OF CORP. BONDS

- Fang (2024) finds bond funds decrease corporate bond holdings after tightening, comes with lower bond prices and firms' bond issuance
- Using monthly regression, we find prone bond funds further reduce their portfolio share in corporate bonds compared to non-prone funds:

$$Y_{i,t} - Y_{i,t-1} = \beta MPS_t \times Prone_i + \theta X_{i,t} + Fixed\ Effects + \epsilon_{i,t}. \quad (5)$$

Reaction of Relative Corporate Bond Holdings of Run-Prone Funds to MPS

Dep. Var. (Δ Share of Fix.-Inc. Portf.)	(1)	(2)
	Corp. Bonds	Corp. Bonds
MPS $\times$ Prone	0.093 (1.113)	-4.730* (2.867)
Observations	141,984	27,949
Adj. R-squared	0.123	0.091
Sample	All	Fixed-Income
Controls	Yes	Yes
ISIN Fixed Effects	Yes	Yes
Date $\times$ Type Fixed Effects	Yes	Yes

Notes: Corp. bond holdings measured as a share of the fixed-inc. portfolio. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

- Fund fragility amplifies monetary policy transmission to bond markets